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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/804,031	03/13/2001	Kiyosi Ito	1448.1012	8835

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EXAMINER	
RAMPURIA, SATISH	

ART UNIT	PAPER NUMBER
2124	

DATE MAILED: 06/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/804,031	ITO ET AL.	
	Examiner	Art Unit	
	Satish S. Rampuria	2124	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 March 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *03/13/2001*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This action is in response to the application filed on 03/13/2001.

2. Claims 1-11 are pending.

Priority

3. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copies have been filed in parent Application No. 2000-309759, filed on October 10, 2000.

Specification

4. The disclosure is objected to because of the following informalities:

On page 4, line 12 "processon", it appears it should be "procession".

Appropriate correction is required

Information Disclosure Statement

5. An initialed and dated copy of Applicant's IDS form 1449, Paper No. 03, is attached to the instant Office action. The translation of abstract is provided for foreign documents only, therefore, only abstract has been considered.

Claim Rejections - 35 USC § 112, second paragraph

6. Claim 2, 5, and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Clarification and/or correction are required.

Regarding, claim 2, on lines 18, and 21, the limitation, "any delay" is unclear as to what kind of delay between commands due to limitation.

Claim 3, has the similar limitation to those in claim 2 with respect to "any delay", recited on the line 11.

Regarding, claim 5, on lines 7, and 8, the limitation, "when the reverse priority" is unclear as to when is the reverse priority values are same during the setting of ascending order.

Claim 10, has the similar limitation to those in claim 5 with respect to "when the reverse priority", recited on line 14.

The rejection of the base claim is necessarily incorporated into the dependent claims.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP 10-207854 to Takashi, hereinafter called Takashi, in view of US Patent No. 5,367,687 to Tarsy et al., hereinafter called Tarsy.

Per claim 1:

Takashi disclose:

- A compiler parallelizing schedule method comprising the steps of (page 2, paragraph 6 "compiler instruction parallelization method" and "scheduling is performed")

- calculating a priority value (page 2, paragraph 11 "a pass latency... number ... of juxtaposition actuation control are calculated") of each of commands based upon mutual dependence between commands (page 2, paragraph 11 "Based on dependence... actuation control graph generated")
- calculating a reverse priority value corresponding to the shortest command ending time for each of the commands (page6, paragraph 51 "scheduling was carried out to the reverse sense (from the instruction executed behind to order) is determined in dependence / juxtaposition actuation control graph")

Takashi does not explicitly disclose weighting each of the commands based upon the reverse priority value; and calculating a new priority value for each of the commands based upon the weighting value applied to each of the commands and the priority value of each of the commands.

However, Tarsy discloses in an analogous computer system weighting each of the commands based upon the reverse priority value (col. 2, lines 13-22 "weight sets to an apparatus... instruction scheduling, each weight set comprising an ordered n-tuple of weights... instruction blocks... determine the lowest accumulated cost and the optimal weight set of the collection."); and calculating a new priority value for each of the commands based upon the weighting value applied to each of the commands and the priority value of each of the commands(col. 2, lines 24-26 "determine a new lowest accumulated cost and a new optimal weight set" and col. 1, lines 34-36 "The total cost for each of the free instructions is computed based on the weighted sum of a plurality of

cost heuristics").

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of weighting of set commands as taught by Tarsy into the method of compiler parallelization as taught by Takashi. The modification would be obvious because of one of ordinary skill in the art would be motivated to weight the instructions in order to optimize the compilation of code as suggested by Tarsy (col. 2, lines 1-6).

9. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takashi in view of Issues in instruction scheduling, published in 1998 by Schielke, hereinafter called Schielke in view of Tarsy and further in view of US Patent No. 6,438,747 to Schreiber et al., hereinafter called Schreiber.

Per claim 2:

Takashi disclose:

- A compiler parallelizing schedule method comprising the steps of (page 2, paragraph 6 "compiler instruction parallelization method" and "scheduling is performed")

- calculating a reverse priority value corresponding to the shortest command ending time for each of the commands (page6, paragraph 51 "scheduling was carried out to the reverse sense (from the instruction executed behind to order) is determined in dependence / juxtaposition actuation control graph")

Takashi does not explicitly disclose checking to see whether or not there is any delay between the commands having the same priority value due to an issue limitation.

However, Schielke discloses in an analogous computer system checking to see whether or not there is any delay between the commands having the same priority value due to an issue limitation (page 11, section "Tie-breaking forward and backward list scheduling- A traditional… scheduler… breaking any ties (having same priority values) in the priority… delays the start… higher latency store…). By breaking the ties between priorities the system inherently checks for delays.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of checking and breaking the ties between commands as taught by Schielke into the method of compiler parallelization as taught by Takashi. The modification would be obvious because of one of ordinary skill in the art would be motivated check and break the ties between commands to optimize the compilation as suggested by Schielke (page 13, paragraph 1).

Neither Takashi nor Schielke explicitly disclose weighting each of the commands based upon the reverse priority value; and calculating a new priority value for each of the commands based upon the weighting value applied to each of the commands and the priority value of each of the commands.

However, Tarsy discloses in an analogous computer system weighting each of the commands based upon the reverse priority value (col. 2, lines 13-22 "weight sets to an apparatus… instruction scheduling, each weight set comprising an ordered n-tuple of weights… instruction blocks… determine the lowest accumulated cost and the optimal weight set of the collection."); and calculating a new priority value for each of the commands based upon the

weighting value applied to each of the commands and the priority value of each of the commands(col. 2, lines 24-26 "determine a new lowest accumulated cost and a new optimal weight set" and col. 1, lines 34-36 "The total cost for each of the free instructions is computed based on the weighted sum of a plurality of

cost heuristics").

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of weighting of set commands as taught by Tarsy into the method of compiler parallelization as taught by the combination system of Takashi and Schielke. The modification would be obvious because of one of ordinary skill in the art would be motivated to weight the instructions in order to optimize the compilation of code as suggested by Tarsy (col. 2, lines 1-6).

Neither Takashi nor Schielke explicitly disclose slot-mapping the respective commands.

However, Schreiber discloses in an analogous computer system slot-mapping the respective commands (col. 2, lines 5-20 "...scheduling method accepts a mapping of iterations of the nested loop to processor elements in a processor array. Based on this mapping and a specified initiation interval, the method programmatically determines a definition of iteration schedules..." see fig. 3).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of mapping the commands as taught by Schreiber into the method of compiler parallelization as taught by the combination system of Takashi and Schielke. The modification would be obvious because of one of ordinary skill in

the art would be motivated to map the commands to optimize the scheduler as suggested by Schielke (col. 2, lines 27-34).

10. Claims 3 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takashi in view of Schielke and further in view of Ostanevich et al., hereinafter called Ostanevich.

Per claims 3 and 10:

The rejection of claim 2 is incorporated, and further, Takashi does not explicitly disclose a group of the commands, each having any delay due to an issue limitation is defined as an optimizing target group.

However, Schielke discloses in an analogous computer system a group of the commands, each having any delay due to an issue limitation is defined as an optimizing target group (page 11, section "Tie-breaking forward and backward list scheduling- A traditional... scheduler... breaking any ties (having same priority values) in the priority... delays the start... higher latency store..." and page 1, paragraph 3, section Introduction "When compiling... code... performed... of improving the code").

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of checking and breaking the ties between commands as taught by Schielke into the method of compiler parallelization as taught by Takashi. The modification would be obvious because of one of ordinary skill in the art would be motivated check and break the ties between commands to optimize the compilation as suggested by Schielke (page 13, paragraph 1).

Neither Takashi nor Schielke disclose, a common precedent command of a plurality of commands contained in the optimizing target group is defined as a neck command, and the reverse priority value is found between the neck command and the optimizing target group.

However, Ostanevich discloses in an analogous computer system a common precedent command of a plurality of commands contained in the optimizing target group is defined as a neck command (col. 4, lines 25-27 "a Data Flow Graph (DFG) which establishes a partial ordering on a set of operations of that expression". Also, see fig. 3), and the reverse priority value is found between the neck command and the optimizing target group (col. 2, lines 13-22 "The list is ordered... with some priority... shown in braces next to the operation in the list. Operations with smaller priority are located at the beginning of the list and will be selected to schedule first". Also, see fig. 3).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of defining the neck command and the priority value found in the list as taught by Ostanevich into the method of compiler parallelization as taught by the combination system of Takashi and Schielke. The modification would be obvious because of one of ordinary skill in the art would be motivated to define the first command as a neck command and listing of priority values to in order to optimize the compilation of code as suggested by Ostanevich (col. 2, lines 23-29).

11. Claims 4 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takashi, Schielke, Ostanevich and further in view of Tarsy.

Per claims 4 and 11:

The rejection of claim 3 is incorporated, and further, neither Takashi, Schielke nor Ostanevich disclose the weighting values include a first weighting value that is applied to the commands from the optimizing target group to the neck command and a second weighting value that is applied to precedent commands preceding the neck command.

However, Tarsy discloses in an analogous computer system the weighting values (col. 2, lines 16-17 "weight set comprising an ordered n-tuple of weights") include a first weighting value that is applied to the commands from the optimizing target group to the neck command (col. 2, lines 59-62 "The systematic varying of weights is performed in ascending order of the weights" and col. 2, lines 9-10 "optimizing... instruction scheduling ... processor") and a second weighting value that is applied to precedent commands preceding the neck command (col. 3, lines 4-7 "a first condition that the lowest accumulated cost under the current weight set is lower than the lowest of the lowest accumulated costs of the previous weight sets").

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of assigning the weighting values to the instructions set and as taught by Tarsy into the method of compiler parallelization as taught by the combination system of Takashi, Schielke and Ostanevich. The modification would be obvious because of one of ordinary skill in the art would be motivated to assign weighting values to optimize the instructions as suggested by Tarsy (col. 2, lines 1-6).

12. Claims 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takashi, Schielke in view of Tarsy.

Per claim 5:

The rejection of claim 4 is incorporated, and further, Takashi does not explicitly disclose wherein with respect to a plurality of commands contained in the optimizing target group (page 1, paragraph 3, section Introduction "When compiling... code... performed... of improving the code").

However, Schielke discloses in an analogous computer system wherein with respect to a plurality of commands contained in the optimizing target group (page 1, paragraph 3, section Introduction "When compiling... code... performed... of improving the code").

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of having the commands for the optimizing the target group as taught by Schielke into the method of compiler parallelization as taught by Takashi. The modification would be obvious because of one of ordinary skill in the art would be motivated to have the optimize commands contained in the optimization group in order to optimize the target command/group.

Neither Takashi nor Schielke disclose, an order of priority is set in an ascending order of the reverse priority values, in an ascending order of the number of the precedent commands when the reverse priority values are the same, in an ascending order of line numbers when the reverse priority value and the number of the precedent commands are the same, and in an ascending order of generation times when the reverse priority value, the number of precedent orders and the line number are the same, and in accordance with the order of priority, the first weighting value is determined.

However, Tarsy discloses in an analogous computer system an order of priority is set in an ascending order of the reverse priority values, in an ascending order of the number of the precedent commands when the reverse priority values are the same (col. 2, lines 59-63 "The systematic varying of weights is performed in ascending order of the weights... varying of one of the weights comprises systematically adding permutations of a varying offset to the weight being varied"), in an ascending order of line numbers when the reverse priority value and the number of the precedent commands are the same (col. 2, lines 59-63 "The systematic varying of weights is performed in ascending order of the weights... varying of one of the weights comprises systematically adding permutations of a varying offset to the weight being varied"), and in an ascending order of generation times when the reverse priority value, the number of precedent orders and the line number are the same (col. 2, lines 37-39 "weight generation... deferent collections of ... weight sets with ordered weights, a benchmark generation... for generating corresponding identical benchmark"), and in accordance with the order of priority, the first weighting value is determined (col. 2, lines 59-62 "The systematic varying of weights is performed in ascending order of the weights").

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to incorporate the method of setting the priority values in an ascending order of values and generation of values in ascending as taught by Tarsy into the method of compiler parallelization as taught by the combination system of Takashi and Schielke. The modification would be obvious because of one of ordinary skill in the art would be motivated to set the priority values in an ascending order of values and generation of values in ascending as to improve the optimization of scheduled instructions suggested by Tarsy (col. 2, lines 1-6).

Per claim 6:

Neither Takashi nor Schielke disclose, wherein in accordance with the order of priority, the first weighting value for the first command is set to a value obtained by subtracting 1 from the number of commands required for issuing the commands within the optimizing target group while taking into consideration the actual issue limitation, and the first weighting value for the commands of the second one and thereafter is set to a value obtained by successively reducing 1 from the value obtained by subtracting 1 from the number of commands.

However, Tarsy discloses in an analogous computer system wherein in accordance with the order of priority, the first weighting value for the first command is set to a value obtained by subtracting 1 from the number of commands required for issuing the commands within the optimizing target group while taking into consideration the actual issue limitation (col. 2, lines 59-61 "The systematic varying of weights is performed in ascending order of the weights" and col. 2, lines 24-27 "to determine a new lowest... cost and a new optimal weight set for a different collection of... weight set with ordered weights"), and the first weighting value for the commands of the second one and thereafter is set to a value obtained by successively reducing 1 from the value obtained by subtracting 1 from the number of commands (col. 2, lines 59-61 "The systematic varying of weights is performed in ascending order of the weights" and col. 2, lines 24-27 "to determine a new lowest... cost and a new optimal weight set for a different collection of ... weight set with ordered weights").

The feature of obtaining the weighting value by subtracting from the number of commands would be obvious for the reasons set forth in the rejection of claim 5.

Per claims 7 and 8:

Neither Takashi nor Schielke disclose, wherein the first weighting value for the precedent commands to the respective commands within the optimizing target group is set to a value that is inherited from the first weighting value for succeeding commands following the precedent commands, and when a plurality of succeeding commands exist, it is set to a value that is inherited from the greatest first weighting value.

However, Tarsy discloses in an analogous computer system wherein the first weighting value for the precedent commands to the respective commands within the optimizing target group is set to a value (col. 2, lines 15-18 "each weight set comprising an ordered n-tuple of weights; providing and identical benchmark for each of the weight sets") that is inherited from the first weighting value for succeeding commands following the precedent commands, and when a plurality of succeeding commands exist, it is set to a value that is inherited from the greatest first weighting value (col. 2, lines 57-59 "generating the… with sets by systematically varying the weights of their immediate predecessor weight sets").

The feature of setting the weighting value that is inherited from the first weighting value would be obvious for the reasons set forth in the rejection of claim 5.

Per claim 9:

Neither Takashi nor Schielke disclose, wherein when a new second weighting value is generated resulting from another optimizing target group different from the optimizing target group corresponding to the neck command, the second weighting value for the precedent

command to the neck command is set to a value that is obtained by adding the second weighting value.

However, Tarsy discloses in an analogous computer system wherein when a new second weighting value is generated resulting from another optimizing target group different from the optimizing target group corresponding to the neck command (col. 2, lines 57-59 "generating the... with sets by systematically varying the weights of their immediate predecessor weight sets"), the second weighting value for the precedent command to the neck command is set to a value that is obtained by adding the second weighting value (col. 2, lines 25-34 "a new lowest... optimal weight set for a different collection of interrelated weight sets with ordered weights... steps repeating with a different collection and evaluating the lowest accumulated costs... over a number of collections").

The feature of generation of weighting values for different set of optimizing groups would be obvious for the reasons set forth in the rejection of claim 5.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patent is cited to further show the state of the art with respect to compiler parallelzing schedule method.

US Patent No. 5,819,088 to Reinders et al.

US Patent No. 5,377,352 to Tanaka et al.

US Patent No. 6,526,573 to Babaian et al.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Satish S. Rampuria** whose telephone number is **703-305-8891**. The examiner can normally be reached on **8:30 am to 5:00 pm**.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Kakali Chaki** can be reached on **(703) 305-9662**. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Satish S. Rampuria

Patent Examiner

Art Unit 2124

06/01/2004

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